The lower quality of preventive care among forced migrants in a country with universal healthcare coverage

Martin, Yonas ; Collet, Tinh-Hai ; Bodenmann, Patrick ; Blum, Manuel R ; Zimmerli, Lukas ; Gaspoz, Jean-Michel ; Battegay, Edouard ; Cornuz, Jacques ; Rodondi, Nicolas

Abstract: OBJECTIVE: To assess the association between socio-demographic factors and the quality of preventive care and chronic care of cardiovascular (CV) risk factors in a country with universal health care coverage. METHODS: Our retrospective cohort assessed a random sample of 966 patients aged 50-80years followed over 2years (2005-2006) in 4 Swiss university primary care settings (Basel/Geneva/Lausanne/Zürich). We used RAND's Quality Assessment Tools indicators and examined recommended preventive care among different socio-demographic subgroups. RESULTS: Overall patients received 69.6% of recommended preventive care. Preventive care indicators were more likely to be met among men (72.8% vs. 65.4%; p<0.001), younger patients (from 71.0% at 50-59years to 66.7% at 70-80years, p for trend=0.03) and Swiss patients (71.1% vs. 62.7% in forced migrants; p=0.001). This latter difference remained in multivariate analysis adjusted for gender, age, civil status and occupation (OR 0.68; 95% CI 0.54-0.86). Forced migrants had lower scores for physical examination and breast and colon cancer screening (all p 0.02). No major differences were seen for chronic care of CV risk factors. CONCLUSION: Despite universal healthcare coverage, forced migrants receive less preventive care than Swiss patients in university primary care settings. Greater attention should be paid to forced migrants for preventive care.

DOI: https://doi.org/10.1016/j.ypmed.2013.11.006

The lower quality of preventive care among forced migrants in a country with universal healthcare coverage

Authors

Yonas Martin, BSc[1], Tinh-Hai Collet, MD[1], Patrick Bodenmann, MD, MPH[1], Lukas Zimmerli, MD[2], Jean-Michel Gaspoz, MD[3], Edouard Battegay, MD[3], Jacques Cornuz, MD, MPH[1], Nicolas Rodondi, MD, MAS[4]

[1] Department for Ambulatory Care and Community Medicine, University of Lausanne, Lausanne, Switzerland; [2] Division of Internal Medicine, University Hospital of Zürich, Zürich, Switzerland; [3] Department of Community Medicine and Primary Care, University Hospitals of Geneva and Faculty of Medicine, Geneva, Switzerland; [4] Department of General Internal Medicine, Inselspital, University of Bern, Switzerland.

Corresponding author

Nicolas Rodondi, MD, MAS
Department of General Internal Medicine
Inselspital, University of Bern, 3010 Bern, Switzerland
Email: Nicolas.Rodondi@insel.ch, Phone: +41 (31) 632 41 63, Fax: +41 (31) 382 43 60

Word count: 270 (abstract) / 2462 (text only)
Tables / Figures: 3 / 1
References: 23

Abstract

Background

Differences in quality of preventive care among different population subgroups have been found in the US, but few studies have examined these differences in countries with universal health coverage. We assessed the association between patient factors, and the quality of preventive care and chronic care of cardiovascular (CV) risk factors in Swiss university primary care settings.

Methods

Our study was based on a retrospective cohort of a random sample of 1002 patients aged 50-80 years followed for 2 years in 4 Swiss university primary care settings. We used indicators derived from RAND's Quality Assessment Tools indicators and calculated percentages of recommended preventive and chronic care among the different socio-demographic subgroups.

Results

Overall, patients received 69.6% of recommended preventive care. Preventive care indicators were more likely to be met among men (72.9% vs. 65.3% in women; p<0.001), younger patients (50-59 years: 70.9%; 60-69 years: 70.1%; 70-80 years: 66.8%; p for trend=0.03) and Swiss patients (71.1% vs. 62.7% in forced migrants; p=0.001). These differences remained in multivariate analysis adjusted for gender, age, civil status and occupation. (OR: 0.68; 95% CI: 0.54-0.86).Forced migrants had lower scores for physical examination, breast and colon cancer screening, and influenza immunization (all p<0.XX).

The overall score for chronic care of CV risk factors was 83.2%. Rates of chronic care of CV risk factors did not differ by gender and legal status, and slightly by age (50-59 years: 84.0% and 70-80 years: 80.0%, p for trend=0.04).

Conclusion

Despite universal healthcare coverage, forced migrants in Swiss university primary care settings received less preventive care than Swiss patients. Greater attention should be paid to forced migrants for preventive care.

Background

Standard indicators of quality of preventive care have been developed in the United States (US) to permit systematic monitoring of quality of care in the country.[1,2,3] Since 2004, a systematic performance monitoring called Quality and Outcomes Framework (QOF) has been conducted in the United Kingdom (UK).[4]

These standard indicators developed in the US and the UK opened the door for a better understanding of the individual factors determining quality of care. Using RAND's Quality Assessment Tools, a quality assessment system that spans over 30 conditions and prevention[1], Asch *et al.* found moderate variation of quality of care among different socio-demographic subgroups in 12 US metropolitan areas. Some US and other studies found differences in delivered care according to socio-demographic characteristics, particularly ethnicity.

However, continental Europe suffers from limited documentation about the quality of preventive care in the general population and even more among different subgroups of patients. To our knowledge, there are only few published data on the quality of preventive care according to socio-demographic status in Continental Europe and more specifically in Switzerland, a country with universal health coverage. Moreover, there are limited data on preventive care among adults on social aid, regardless of their age or whether they work. We recently reported that preventive care indicators were less likely to be met in women and the elderly.[5] Moreover, a previous study in the *canton* (state) of Geneva, Switzerland, pointed out shortfalls in terms of pre-natal preventive care for undocumented migrant women when compared to legally settled migrants.[6]

.

Among this random sample of 1002 patients followed in Swiss University primary care settings, we aimed to determine which subgroups of the population received less preventive care and chronic care of cardiovascular risk factors (RFs), and to explore the determinants of gaps in preventive care.

Methods

Study Design and Patients

As previously reported,[5] we abstracted medical charts from a random sample of 1002 patients followed by PCPs in four Swiss university primary care settings (Basel, Geneva, Lausanne, and Zürich) in a retrospective cohort study. The sample was randomly selected from electronic administrative data of all patients aged 50 to 80 years followed in 2005-2006. We limited our sample to this age group to have a high enough prevalence of examined indicators (e.g., CVRFs, eligibility for cancer screening or influenza immunization). We did not include patients who were followed in the clinical setting for <1 year to have adequate time and information to assess provided preventive care.

Quality Indicators

As already described,[5] we selected 33 quality indicators from RAND's QA Tools [1,2] regarding preventive care and the chronic care of cardiovascular RFs: 14 indicators aimed at preventive care (physical examination: 3; alcohol: 2; smoking cessation: 5; cancer screening: 2; influenza immunization: 2) and 19 at chronic care of three major cardiovascular RFs (hypertension: 4; dyslipidemia: 2; diabetes: 13). Chosen indicators focused on processes of care, because they represent the activities that clinicians control most directly.[1] We did not include preventive care indicators that were not applicable to our local guidelines or PCP settings (e.g., pregnancy follow-up is very rarely performed by PCPs in Switzerland) or indicators for conditions with likely low prevalence in our sample (e.g. asthma).[5]

Chart Abstraction

As previously reported, centrally trained medical students abstracted medical charts with a chart abstraction form.[5] In addition to the 33 indicators derived from RANDS's QA Tools, we abstracted demographic and comorbidity covariates, such as gender, age, civil status, occupation, birth place and legal status, with a chart abstraction form derived from the TRIAD study (Translating Research into Action for Diabetes).[7] Legal status was grouped into 3 categories: Swiss nationality, Residence permit holders, and Forced migrants[8]. Civil status was categorized into four groups (Married, Divorced and Separated, Single, Widow-er) and occupation into five groups (Retired, Employed, At home, Social aid and Unemployed). To ensure adequately sized and large enough groups for statistical analyses, birth place classification was slightly adapted from the WHO Region Classification as specified in the Table 1 footnotes.

Statistical Analysis

For each selected indicator of preventive care and chronic care for cardiovascular RFs, we calculated the percentage of provided recommended care by dividing all episodes in which recommended care was delivered by the number of times patients were eligible for indicators (overall percentage method),[9] as previously described.[5] When care was refused by eligible patients, it was counted as provided care to measure physician-initiated care. The results were presented as percentages with 95% binomial exact confidence intervals (CI). To summarize the selected indicators, we calculated aggregate scores of quality of care among the different categories of prevention (physical examination, counseling, screening and immunization) and a global aggregate score for preventive care. All these aggregate scores were calculated by taking into account the number of eligible patients for each selected

indicator. The same method of calculation was used to obtain the aggregate scores of chronic care for hypertension, dyslipidemia and diabetes, and a global aggregate score for chronic care for cardiovascular RFs, summarizing care for these three conditions. We used generalized estimating equation (GEE) binomial models to compare differences in percentages of recommended preventive care and to assess the association between demographic characteristics and the proportion of provided care. GEE models were used to account for correlation of multiple measurements for the same patient and for different numbers of eligible patients for each recommended preventive care. We conducted a multivariate analysis adjusting for gender, age, civil status, occupation and legal status. Birth place was not included into the multivariate analysis due to the strong colinearity with legal status: 82% of the patients having the Swiss nationality were born in Switzerland, even though Swiss nationality by birth in the territory (*jus soli*) is not applied. We further used a backward deletion to determine potential confounders. To account for clustering by the four sites, we treated each primary care center as a fixed effect. We used Stata software (version 12.1, Stata Corp., College Station, TX) for all statistical analyses.

Results

The mean age of our sample was 63.5 years with 44.4% of women (Table 1). Fifty-eight percent of patients were Swiss, one third had a residence permit and eight percent were forced migrants Fifty-one percent of patients were married and 23.5% divorced or separated. Nearly half of the patients (46%) were born in Switzerland, 37.1% in Europe or North America, and 16.6% on other continents. The prevalence of cardiovascular RFs was 75% for hypertension, 62% for dyslipidemia and 29% for diabetes.

In a multivariate analysis, patients received overall 69.6% (CI 68.6-70.7) of recommended preventive care (Table 2). Women had lower scores than men (65.3% vs. 72.9%, respectively, $p<0.001$) mostly because of shortfalls in terms of alcohol consumption counseling (63.0% vs. 71.7%, resp., $p<0.001$), and influenza immunization (28.9% vs. 35.8%, resp., $p=0.03$). Quality of preventive care decreased with age from 70.9% for patients aged 50-59 to 66.8% for 70-80 years (p for trend 0.03). Lower rates of physical examination (p for trend 0.007) and alcohol consumption counseling (p for trend 0.02) were the main reasons for lower scores in the elderly. Swiss participants had higher scores (71.1%) than resident permit holders (68.7%, $p=0.048$) and forced migrants (62.7%, $p=0.001$). The lower score of preventive care for forced migrants was mainly in the domains of cancer screening (p value) and influenza immunization (p value) (Appendix Table 2). Occupation was not associated with differences in preventive care scores. After backwards deletion with a cutoff p value < 0.2, occupation was the only removed socio-demographic characteristic, its exclusion leading to similar results.

Overall, participants received 83.2% of recommended chronic care of cardiovascular RFs (Table 3). The elderly (70-80 years) had lower scores than the youngest age category (80.0% vs. 84.0%, p for trend 0.03). Divorced and separated patients were more likely to receive

recommended chronic care of cardiovascular RF than married patients (85.4% vs. 82.4%, resp., p=0.02). Other categories of civil status, occupation, and legal status were not associated with differences in quality of chronic care of cardiovascular RF. After backwards deletion with a cutoff p value < 0.2 in the multivariate analysis, gender, occupation and legal status were left out of the model, emphasizing the importance of age and civil status of the participants.

Asylum seekers are immigrants having a particular status while waiting their asylum request being accepted or rejected. They are notably covered in terms of health care. Undocumented immigrants don't have any official legal status and are either people whom asylum request was rejected or immigrants who never declared their presence to authorities. In post-hoc analyses, we further studied the 81 forced migrants that comprised 31 asylum seekers and 50 undocumented immigrants. Asylum seekers were more likely to be men (58%), married (58%), unemployed (97%), born in Europe (55%), while undocumented immigrants were more often women (78%), divorced or separated (36%), employed (72%) and from Latin America (74%, p for all comparisons <0.XX TO DO). In multivariate analyses, asylum seekers had lower preventive care scores (57.7%, CI 48.8-66.1) than undocumented immigrants (65.4%, CI 59.6-70.9, p=0.004), although both groups had lower preventive care scores as compared to the Swiss patients (Asylum seekers p=0.002; Undocumented immigrants p=0.051).

Discussion

Using standard indicators of preventive care developed in the US, we found that in Switzerland, a country with universal health care coverage, delivery of recommended preventive care varied according to socio-demographic characteristics. Forced migrants had lower scores of preventive care compared to Swiss patients, while men had higher scores than women and younger patients than the elderly. Aggregate scores of chronic care of cardiovascular RFs did not differ according to socio-demographic characteristics except among the elderly where lower rates were observed.

To our knowledge, our study is one of the very first in Continental Europe assessing socio-demographic differences on such a broad range of preventive indicators. In the U.S., Asch *et al.* showed that ethnicity moderately determines overall quality of care: In terms of preventive care, hispanics had statistically significant higher scores than other ethnic group.[2] Higher overall scores of quality of care were found for young patients (<31 years) than the elderly (>64 years), women than men, Blacks and Hispanics than Caucasians and those with a high income (>$50,000) than those with incomes of less than $15,000.[2] Most other US studies focused on specific indicators or conditions making a comparison with our results difficult and found moderate variation of quality of care among different ethnic groups.[10,11]

Gray *et al.* showed that in the UK, non-Whites were significantly less likely to meet the national treatment targets for hemoglobin A1c, blood pressure, and cholesterol.[10] Studies in the UK mainly describe differences among ethnic groups for specific indicators, such as blood pressure monitoring with little evidence of any ethnic inequality. [12] Considering that immigrants are coming from all around the world, ethnicity is to some extent related to the

legal status, enabling us to make some careful comparisons of our results with those from the US and the UK that are consistent with ours even though not perfectly comparable. A previous study made in the *canton* (state) of Geneva (Switzerland), pointed out shortfalls in terms of pre-natal preventive care for undocumented migrant women when compared to legally settled migrants.[6]

In Switzerland, all inhabitants have healthcare coverage, even those in special circumstances such as asylum seekers through a restricted gate-keeping access to healthcare.[13]

There are multiple potential hypotheses explaining why forced migrants receive lower preventive care scores than Swiss citizens. First, language barriers are reported as a limiting factor in access to healthcare for foreigners. [14-19] Interpreters are unfortunately not always available, even in university primary care settings collaborating with an interpreter service. Second, there is probably a lack of knowledge about health promotion and health screening programmes among migrants.[20] Migrants suffer from different health issues than the native population. Even within the migrant population, the prevalence of different health disorders may vary according to the country of origin. A Swedish study showed differences between migrants and native citizens aged 70 years in self-reported chronic health issues, migrants suffering more often of some specific chronic symptoms such as poor vision, urinary difficulties and dizziness.[21] A Swiss survey of the migrant population health in 2007 showed variations of self-reported health between different subgroups, particularly according to the country of origin, the legal status or the socio-economic level.[13,22] Finally, undocumented immigrants may forgo healthcare for economical reasons or fear of notification of their stay to the police,[6] even though there is possibility to subscribe a health insurance without being reported to the immigration administration. Even if health access is slightly restricted for

forced migrants, in particular for undocumented migrants, clinical recommendations are similar to those for the general population

Our study has several limitations.[5] Our data were only abstracted from medical charts, exposing to potential underreport. A previous study comparing process-based quality scores using standardized patients, clinical vignettes, and medical chart abstraction, found that differences were <10%.[23] Second, as previously reported,[5] some indicators had lower inter-rater reliability between abstractors (kappa <0.6): i.e. lifestyle modifications for hypertension, annual eye exam, biannual foot exam and biannual A1c for diabetics. Third, all study participants were followed in university primary care settings. Thus our data may not be generalizable to community-based primary care physicians. Fourth, our multivariate analyses might have been over-adjusted for occupation, because of potential colinearity between occupation and legal status (51% of forced migrants were unemployed). However, multivariate analyses not adjusted for occupation yielded similar results. Finally, some subgroups were small and statistical analyses might be underpowered. However, our study pointed out some trends that could be assessed at a larger scale.

Although we found discrepancies in quality of preventive care between socio-demographic subgroups, most differences were mild. The biggest gap in preventive care scores were among the forced migrants, having significantly lower scores than Swiss citizen. Minorities such as forced migrants are often called vulnerable populations and prevention targets should also be aimed at them at least as accurately as for the general population. To improve healthcare of forced migrants, a multi-level approach is desirable, involving decision makers, researchers, clinicians and specialized medical staff.[15] Decision makers have the power to improve general care of minorities by taking informative and financial measures or

even implementing a new health policy. For instance, funding a campaign describing the shortfalls in terms of quality of prevention faced by the outcasts would be a conceivable first line measure. Researchers have a key role in conducting future and larger studies to further document the variation of quality of care among subgroups and clarify possible interventions for decision makers. Increasing physicians' awareness to this topic by targeted medical educational programs might be useful. Finally, units designed for vulnerable populations as the ones already running and that are taking into consideration many aspects of the attending patients might be a milestone for these migrants to overcome language barriers, cultural differences and economic issues.

References

1. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. The New England journal of medicine 2003;348:2635-45.
2. Asch SM, Kerr EA, Keesey J, et al. Who is at greatest risk for receiving poor-quality health care? The New England journal of medicine 2006;354:1147-56.
3. HEDIS 2007. 2007. (Accessed at http://www.ncqa.org/Portals/0/Publications/Resource%20Library/SOHC/SOHC_07.pdf.)
4. Roland M. Linking physicians' pay to the quality of care--a major experiment in the United kingdom. The New England journal of medicine 2004;351:1448-54.
5. Collet TH, Salamin S, Zimmerli L, et al. The quality of primary care in a country with universal health care coverage. J Gen Intern Med 2011;26:724-30.
6. Wolff H, Epiney M, Lourenco AP, et al. Undocumented migrants lack access to pregnancy care and prevention. BMC Public Health 2008;8:93.
7. Kerr EA, Gerzoff RB, Krein SL, et al. Diabetes care quality in the Veterans Affairs Health Care System and commercial managed care: the TRIAD study. Annals of internal medicine 2004;141:272-81.
8. Bartlett LA, Purdin S, McGinn T. Forced migrants--turning rights into reproductive health. Lancet 2004;363:76-7.
9. Reeves D, Campbell SM, Adams J, Shekelle PG, Kontopantelis E, Roland MO. Combining multiple indicators of clinical quality: an evaluation of different analytic approaches. Medical care 2007;45:489-96.
10. Gray J, Millett C, Saxena S, Netuveli G, Khunti K, Majeed A. Ethnicity and quality of diabetes care in a health system with universal coverage: population-based cross-sectional survey in primary care. J Gen Intern Med 2007;22:1317-20.
11. Wortley P. Who's getting shots and who's not: racial/ethnic disparities in immunization coverage. Ethnicity & disease 2005;15:S3-4-S3-6.
12. Schofield P, Saka O, Ashworth M. Ethnic differences in blood pressure monitoring and control in south east London. Br J Gen Pract 2011;61:190-6.
13. (OFSP) Ofdlsp. Qu'est-ce qu'on sait de l'état de santé des populations migrantes. In; 2007.
14. Jacobs E, Chen AH, Karliner LS, Agger-Gupta N, Mutha S. The need for more research on language barriers in health care: a proposed research agenda. The Milbank quarterly 2006;84:111-33.
15. Bodenmann P, Althaus F, Burnand B, Vaucher P, Pecoud A, Genton B. Medical care of asylum seekers: a descriptive study of the appropriateness of nurse practitioners' care compared to traditional physician-based care in a gatekeeping system. BMC Public Health 2007;7:310.
16. Fiscella K, Franks P, Doescher MP, Saver BG. Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. Medical care 2002;40:52-9.
17. Graham EA, Jacobs TA, Kwan-Gett TS, Cover J. Health services utilization by low-income limited English proficient adults. Journal of immigrant and minority health / Center for Minority Public Health 2008;10:207-17.
18. Hargreaves S, Holmes A, Friedland JS. Refugees, asylum seekers, and general practice: room for improvement? Br J Gen Pract 2000;50:531-2.
19. Jones D, Gill PS. Refugees and primary care: tackling the inequalities. BMJ 1998;317:1444-6.
20. O'Donnell CA, Higgins M, Chauhan R, Mullen K. "They think we're OK and we know we're not". A qualitative study of asylum seekers' access, knowledge and views to health care in the UK. BMC Health Services Research 2007;7:75.
21. Silveira E, Skoog I, Sundh V, Allebeck P, Steen B. Health and well-being among 70-year-old migrants living in Sweden--results from the H 70 gerontological and geriatric population studies in Goteborg. Social psychiatry and psychiatric epidemiology 2002;37:13-22.
22. (OFSP) Ofdlsp. Santé des migrantes et des migrants en Suisse. In; 2012.

23. Peabody JW, Luck J, Glassman P, Dresselhaus TR, Lee M. Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. JAMA : the journal of the American Medical Association 2000;283:1715-22.

Table 1. Characteristics of a random sample of 1002 adults aged 50-80 years in 4 Swiss University primary care settings

	Overall	Swiss nationality	Residence permit holders	Forced migrants [a]	P-value for difference
No. participants	1002	560	325	81	
Women, no (%)	445 (44.4)	247 (44.1)	132 (40.6)	52 (64.2)	0.001
Age					
Mean, yr (SD)	63.5 (8.3)	65.2 (8.1)	62.2 (7.9)	57.3 (6.0)	0.004
Range, min - max	50 - 80	50 - 80	50 - 80	50 - 80	
Civil status (n = 993), no (%)					<0.001
Married	506 (51.0)	262 (47.0)	199 (61.8)	29 (35.8)	
Divorced, separated	233 (23.5)	144 (25.9)	58 (18.0)	23 (28.4)	
Single	151 (15.2)	95 (17.1)	34 (10.6)	16 (19.8)	
Widow/-er	103 (10.4)	56 (10.1)	31 (9.6)	13 (16.0)	
Occupation [b] (n = 982), no (%)					<0.001
Retired	372 (37.9)	254 (46.3)	102 (32.0)	1 (1.3)	
Employed	287 (29.2)	164 (29.9)	78 (24.5)	37 (46.3)	
At home	115 (11.7)	62 (11.3)	48 (15.0)	1 (1.3)	
Social aid	110 (11.2)	54 (9.8)	52 (16.3)	0 (0.0)	
Unemployed	98 (10.0)	15 (2.7)	39 (12.2)	41 (51.3)	
Birth Place [c] (n = 992), no (%)					<0.001
Switzerland	459 (46.3)	459 (82.3)	0 (0.0)	0 (0.0)	
Europe + North America	368 (37.1)	71 (12.7)	257 (79.1)	21 (25.9)	
Eastern Mediterranean Region	32 (3.2)	8 (1.4)	21 (6.5)	3 (3.7)	
African Region	39 (3.9)	8 (1.4)	16 (4.9)	10 (12.3)	
Latin America	55 (5.5)	5 (0.9)	10 (3.1)	40 (49.4)	
South East Asia + Western Pacific	39 (3.9)	7 (1.3)	21 (6.5)	7 (8.6)	
Cardiovascular risk factors [d], no (%)					
Hypertension	753 (75.1)	425 (75.9)	250 (76.9)	50 (61.7)	0.014
Dyslipidemia	622 (62.1)	347 (62.0)	212 (65.2)	39 (48.1)	0.016
Diabetes	292 (29.1)	140 (25.0)	125 (38.5)	19 (23.5)	<0.001
Family history of early CHD [e]	99 (9.9)	62 (11.1)	28 (8.6)	17 (21.0)	0.464
Smoking status at baseline [f]					
Former smokers	177 (17.7)	110 (19.6)	55 (16.9)	4 (4.9)	0.001
Current smokers	230 (23.0)	133 (23.8)	75 (23.1)	16 (19.8)	0.477
At risk consumers or binge drinkers [g]	132 (13.2)	84 (15.0)	40 (12.3)	3 (3.7)	0.02

[a] Forced migrants comprised 31 asylum seekers and 50 undocumented immigrants. 3 patients whose asylum request had been rejected were grouped with undocumented immigrants. For 36 patients, legal status was unknown.

[b] Occupation was reclassified accordingly: 2 part-time worker patients were defined as "Employed", 2 patients in education were assigned to "At home", 1 patient who was seeking social aid was classified as on "Social Aid".

[c] Birth place was classified according to the WHO Region classification: North America was gathered with Europe, Algeria with Eastern Mediteranean Region, Somalia with Africa.

[d] Criteria of Dyslipidemia, Hypertension and Diabetes are defined in Appendix Table 1.

[e] Early Coronary Heart Disease (CHD) was defined as a CHD event in male relatives < 55 years or in female relatives < 65 years.

[f] Smoking status was defined as: Former smoker = stopped smoking ≥ 6 months before baseline; current smoker = smoking at baseline or stopped < 6 months before baseline.

[g] At risk drinking was defined as >14 drinks per week for men <65 years or >7 drinks per week for others. Binge drinking was defined as >4 drinks per occasion for men <65 years or >3 drinks for others.

Table 2. Adjusted aggregate scores of recommended preventive care delivered to patients, according to their characteristics

N = 1002	Multivariate adjusted aggregate scores (95% CI) [a]	Odd ratios (Multivariate, 95% CI)	P value
Overall preventive care	69.6 (68.6-70.7)	-	
Gender			
Women	65.3 (63.4-67.1)	ref	ref
Men	72.9 (71.5-74.3)	1.43 (1.27-1.61)	<0.001
Age			
50-59 yr	70.9 (69.0-72.8)	ref	p for trend 0.03
60-69 yr	70.1 (68.2-71.8)	0.96 (0.84-1.09)	
70-80 yr	66.8 (63.9-69.5)	0.82 (0.69-0.98)	
Civil Status			
Married	69.2 (67.7-70.6)	ref	ref
Divorced, separated	71.7 (69.6-73.7)	1.13 (1.00-1.27)	0.053
Single	66.5 (63.2-69.7)	0.89 (0.75-1.04)	0.15
Widow/-er	71.3 (67.6-74.7)	1.11 (0.92-1.33)	0.29
Occupation			
Retired	69.6 (67.4-71.7)	ref	ref
Employed	70.3 (67.9-72.5)	1.03 (0.87-1.22)	0.72
At home	70.3 (67.2-73.1)	1.03 (0.86-1.23)	0.73
Social aid	68.8 (65.2-72.1)	0.96 (0.78-1.17)	0.69
Unemployed	67.8 (63.6-71.8)	0.92 (0.73-1.17)	0.49
Legal Status			
Swiss nationality	71.1 (69.7-72.4)	ref	p for trend 0.001
Residence permit holders	68.7 (66.6-70.6)	0.89 (0.79-0.99)	
Forced migrants	62.7 (57.6-67.4)	0.68 (0.54-0.86)	

[a] Aggregate scores of preventive care were adjusted for gender, age category, civil status, occupation, legal status and center as a fixed-effect.

Table 3. Adjusted aggregate scores of recommended chronic care of cardiovascular risk factors delivered to patients, according to their characteristics

N = 835	Multivariate adjusted aggregate scores (95% CI) [a]	Odd ratios (Multivariate, 95% CI)	P value
Overall chronic care of cardiovascular risk factors	83.2 (82.0-84.3)	-	
Gender			
Women	83.1 (81.2-84.9)	ref	ref
Men	83.2 (81.5-84.7)	1.0 (0.83-1.21)	0.98
Age			
50-59 yr	84.0 (81.8-85.9)	ref	p for trend 0.03
60-69 yr	84.4 (82.6-86.0)	1.03 (0.85-1.26)	
70-80 yr	80.0 (77.2-82.5)	0.76 (0.59-0.98)	
Civil Status			
Married	82.4 (80.7-83.9)	ref	ref
Divorced, separated	85.5 (83.4-87.4)	1.26 (1.04-1.54)	0.02
Single	82.0 (78.2-85.3)	0.98 (0.75-1.27)	0.86
Widow/-er	83.4 (79.8-86.5)	1.08 (0.83-1.40)	0.58
Occupation			
Retired	83.6 (81.5-85.6)	ref	ref
Employed	81.8 (79.1-84.2)	0.88 (0.69-1.12)	0.30
At home	83.5 (80.2-86.3)	0.99 (0.76-1.29)	0.94
Social aid	81.7 (77.4-85.4)	0.88 (0.64-1.20)	0.41
Unemployed	85.5 (81.3-88.9)	1.16 (0.81-1.65)	0.42
Legal Status			
Swiss nationality	83.8 (82.2-85.3)	ref	ref
Resident permit holders	82.6 (80.7-84.3)	0.92 (0.78-1.09)	0.31
Forced migrants	80.2 (74.1-85.2)	0.79 (0.53-1.16)	0.22

[a] Aggregate scores of preventive care were adjusted for gender, age category, civil status, occupation, legal status and center as a fixed-effect.

Appendix Table 1. Diagnostic criteria for Dyslipidemia, Hypertension and Diabetes [a]

Condition	Diagnostic criteria (at least one criteria)
Dyslipidemia	1. At least 1 prescription for a lipid-lowering agent 2. Outpatient diagnosis of dyslipidemia or hypercholesterolemia with a previous LDL cholesterol value ≥ risk-appropriate cut-point value, as defined by NCEP ATP III
Hypertension	1. At least 1 prescription for an antihypertensive medication plus an outpatient diagnosis of hypertension 2. At least 2 outpatient diagnoses of hypertension 3. At least 1 prescription for an antihypertensive medication plus 1 or more elevated outpatient blood pressure readings (≥140 mmHg systolic or ≥90 mmHg diastolic) 4. At least 1 outpatient diagnosis of hypertension plus at least 1 blood pressure reading of ≥140 mmHg systolic or ≥90 mmHg diastolic
Diabetes	1. At least 1 prescription of insulin or an oral hypoglycemic agent 2. At least 2 outpatient diagnoses of diabetes mellitus 3. One outpatient diagnosis of diabetes mellitus plus HbA1c ≥7% 4. At least 1 hospital discharge with a primary diabetes mellitus-related diagnosis 5. At least 2 fasting glycemia ≥7.0 mmol/l 6. At least 2 times 2-hour plasma glucose ≥11.0 mmol/l during an oral glucose tolerance test

[a] Adapted from Rodondi N, et al. (Therapy modifications in response to poorly controlled hypertension, dyslipidemia, and diabetes mellitus. Ann Intern Med 2006;144:475-84)

Appendix Table 2. Recommended Preventive Care according to legal status

	Swiss (n = 560)			Residence permit holders (n = 325)			Forced migrants (n = 81)		
	Eligible patients no	Care provided [a] no	Care provided % (95% CI)	Eligible patients no	Care provided [a] no	Care provided % (95% CI)	Eligible patients no	Care provided [a] no	Care provided % (95% CI)
Global aggregate score for Preventive Care			**69.2 (67.8-70.6)**			**68.6 (66.7-70.4)**			**65.4 (61.5-69.2)**
Physical examination									
Annual blood pressure measurement	560	530	94.6 (92.4-96.4)	325	313	96.3 (93.6-98.1)	81	74	91.4 (83.0-96.5)
Weight measurement	560	542	96.8 (95.0-98.1)	325	305	93.8 (90.7-96.2)	81	73	90.1 (81.5-95.6)
Height measurement	560	418	74.6 (70.8-78.2)	325	253	77.8 (72.9-82.2)	81	57	70.4 (59.2-80.0)
Aggregate score for physical examination			88.7 (87.1-90.2)			89.3 (87.2-91.2)			84.0 (78.7-88.3)
Alcohol consumption counseling									
Asked about drinking problem	560	365	65.2 (61.1-69.1)	325	225	69.2 (63.9-74.2)	81	58	71.6 (60.5-81.1)
Advice to decrease drinking for at risk or binge drinkers [b]	84	64	76.2 (65.7-84.8)	40	33	82.5 (67.2-92.7)	3	2	66.7 (9.4-99.2)
Aggregate score for alcohol consumption counseling			66.6 (62.8-70.3)			70.7 (65.7-75.3)			71.4 (60.5-80.8)
Smoking cessation counseling									
Smoking status documented	560	438	78.2 (74.6-81.6)	325	253	77.8 (72.9-82.2)	81	69	85.2 (75.6-92.1)
Annual advice to quit smoking	133	96	72.2 (63.7-79.6)	75	55	73.3 (61.9-82.9)	16	11	68.8 (41.3-89.0)
Counseling offered to smokers attempting to quit	45	30	66.7 (51.0-80.0)	21	15	71.4 (47.8-88.7)	8	5	62.5 (24.5-91.5)
Pharmacotherapy offered to smokers attempting to quit if more than 10 cigarettes per day	45	20	44.4 (29.6-60.0)	21	10	47.6 (25.7-70.2)	8	5	62.5 (24.5-91.5)
Abstinence documented 4 weeks after smoking cessation counseling	30	15	50.0 (31.3-68.7)	15	6	40.0 (16.3-67.7)	5	2	40.0 (5.3-85.3)

Aggregate score for smoking cessation counseling			73.7 (70.5-76.7)			74.2 (69.9-78.1)			78.0 (69.4-85.1)
Cancer screening [c]									
Screening for colon cancer (aged 50-80)	551	212	38.5 (34.4-42.7)	317	105	33.1 (28.0-38.6)	80	18	22.5 (13.9-33.2)
Screening for breast cancer (aged 50-70)	155	68	43.9 (35.9-52.1)	94	37	39.4 (29.4-50.0)	52	17	32.7 (20.3-47.1)
Aggregate score for cancer screening			39.7 (36.0-43.4)			34.5 (30.0-39.4)			26.5 (19.2-34.9)
Influenza immunization									
Annual influenza vaccine for patients ≥ 65 years	276	99	35.9 (30.2-41.8)	121	39	32.2 (24.0-41.3)	14	3	21.4 (4.7-50.8)
Annual influenza vaccine for immunocompromised patients < 65 years [d]	137	50	36.5 (28.4-45.1)	108	22	20.4 (13.2-29.2)	19	5	26.3 (9.1-51.2)
Aggregate score for influenza immunization			36.1 (31.4-40.9)			26.6 (21.0-32.9)			24.2 (11.1-42.3)

[a] When care was refused by eligible patients, it was counted as provided care to measure physician-initiated health care. When care was provided less frequently than specified (i.e. once a year instead of twice a year, or only once instead of annually), it was counted as unprovided care to measure physician adherence to recommendations.
[b] Definitions of at risk drinking and binge drinking are detailed in Table 1 footnotes.
[c] Patients were excluded of screening because of a prior diagnosis of colon cancer (n = 18) or breast cancer (n = 17).
[d] Indications to influenza immunization for patients younger than 65 years: living in a nursing home, chronic cardiovascular disease, chronic obstructive pulmonary disease, renal failure, diabetes, immunosuppression, hemoglobinopathy.

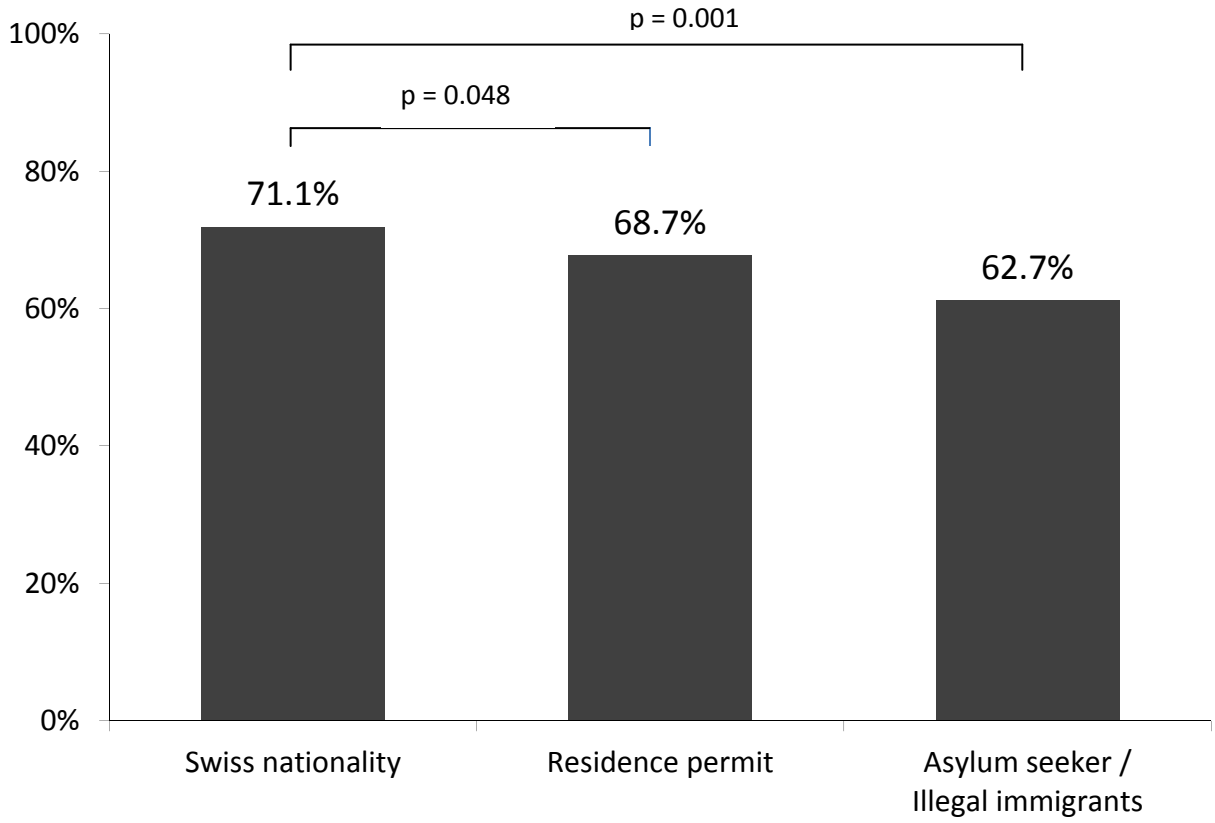

Figure 1. Preventive care according to legal status

Scores adjusted for gender, age category, civil status, occupation, legal status and center as a fixed-effect.